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"ANTI-HUMPS" IN THE DWARF NOVA RZ LEONIS

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In this article we report the discovery of "anti-humps" in the quiescence light curve of RZ Leo. This is a rather atypical phenomenon in dwarf novae, and we urge for more observations to fully clarify this new view. A complete long-term observational study of RZ Leo including the observations reported here is in preparation.

The long-cycle length dwarf nova RZ Leonis Majoris was observed in early 1998 at the 0.92 m DUTCH telescope of the ESO La Silla Observatory. 300-s integration CCD images, obtained through the V filter were reduced in the standard way using the astronomy package *IRAF*[†]. Instrumental magnitudes were extracted using the *IRAF phot* aperture photometry package. Differences between variable, comparison and check stars were calculated and then shifted to an absolute scale using the star for which $V = 14.201$ is given by Misselt (1996). This star was also used as comparison, and a fainter star, of similar brightness to RZ Leo, was used as check. In these conditions the variance of the differences of the check star provides a good estimate of the expected variance (instrumental) of the RZ Leo light curve. Observations are summarized in Table 1.

Figure 1 shows the differential light curves folded with the period $0\overset{d}{.}0756$ (Mennickent & Sterken 1999). The evolution of the hump is singular. It starts as a $0\overset{m}{.}15$ absorption feature (07/01/98), then disappears from the light curve (11/01/98 and 06/02/98) and then re-appears like a small wave (07/02/98) and fully developed symmetrical hump (18/03/98 and 19/03/98). Secondary humps are also visible, with amplitude roughly 60% of the main hump amplitude. On February 7 a secondary absorption hump is also visible, along with the main absorption feature. These "anti-humps" appear at the same phases where normal humps develop one month later. A close inspection of the data of February 7 reveals an alternative interpretation: the observed minima could define the base of the humps. We have rejected this point of view for three reasons:

1. it does not fit the ephemeris, indicating a possible shift of the hump maximum by about 0.2 cycles
2. the peak-to-peak distance between main and secondary maxima should be 0.3 cycles instead of 0.5 cycles, which is observed on the other 3 nights and
3. the amplitude of secondary maximum should be about 80% of the main peak, contrasting with a value of 60% observed on the other nights.

[†]IRAF is distributed by the National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation

Table 1: Journal of observations. N is the number of science frames per night. HJD is the heliocentric Julian day at the start of the night, referred to the zero point 2 440 000. The variance of the differences between check and comparison star is given (in hundredths of magnitude).

Date (UT)	HJD	N	σ_{C-CH}	$\overline{V}$
07/01/98	10820.7488	25	0.02	19.08
11/01/98	10824.7719	27	0.02	19.13
06/02/98	10850.7540	30	0.01	19.06
07/02/98	10851.7520	30	0.02	18.94
18/03/98	10890.6939	36	0.02	18.71
19/03/98	10891.6219	22	0.02	18.67

Humps are believed to trace the hot spots in CVs. These hot spots are normally produced in the shock region where the gas stream hits the accretion disk. The correlation between main and secondary hump amplitudes supports the hypothesis of a single hot spot seen front and back orbiting the binary center of mass. In addition, the correlation between hump's amplitude and mean brightness could indicate a dependence of the mass transfer in the disk on the mass transfer rate from the secondary. Our observations should constrain models of gas dynamics in close binary systems, specially those considering the region of stream–disk interaction.

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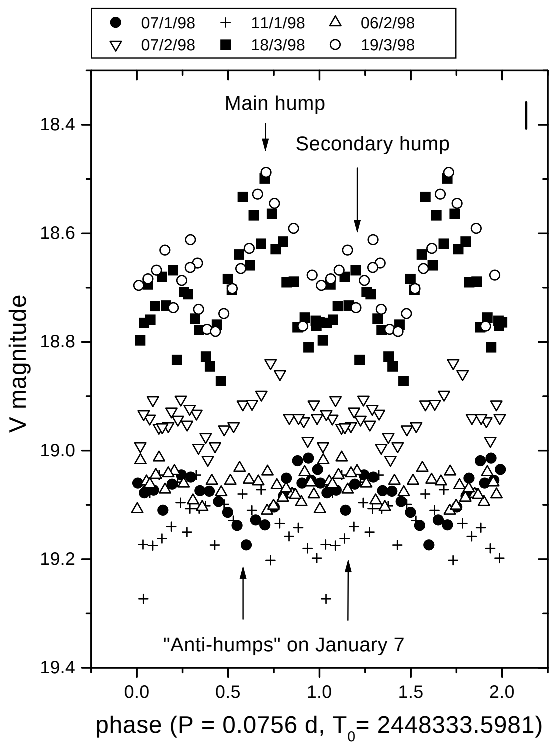

Figure 1. Light curves of RZ Leo folded with a period $0^{\mathrm{d}}_{\cdot}0756$.

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Mennickent, R.E., Sterken, C., 1999 in preparation.
Misselt, K.A., 1996, PASP 108, 146.